

WHAT IS CLAIMED IS:

1. A multi-layer barrier against pests comprising:
at least one pesticide-releasing layer; and
5 at least one pesticide-retaining layer positioned parallel to the pesticide-releasing layer, the pesticide-releasing layer containing at least one pesticide, the pesticide-retaining layer releasing only minute amounts of the pesticide therethrough.
- 10 2. The multi-layer barrier of claim 1, wherein the pesticide-retaining layer comprises Saranex®.
3. The multi-layer barrier of claim 1, wherein two pesticide-retaining layers are positioned on opposite sides of the pesticide-releasing layer.
- 15 4. The multi-layer barrier of claim 1, wherein the pesticide-retaining layers are made from a polymeric material, the polymeric material allowing substantially no release of the pesticide from the barrier.
- 20 5. The multi-layer barrier of claim 1, wherein the pesticide-releasing layer comprises:
a polymeric matrix; and
a pesticide in the matrix.
- 25 6. The multi-layer barrier of claim 5, wherein the pesticide is selected from pyrethroids, neonicotinoids, isofenphos, fenvalerate, pyrethrin, and combinations thereof.
7. The multi-layer barrier of claim 5, wherein the pesticide is selected from
30 tefluthrin, permethrin, lambda cyhalothrin, resmethrin, deltamethrin, cypermethrin, cyphenothrin, cyfluthrin, deltamethrin, chlorpyrifos, fenoxycarb, diazinon,

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dichlorophen, methyl isothiocyanate, pentachlorophenol, tralomethrin, chlorfenapyr, fipronil, neonicotinoids, and combinations thereof.

- 5 8. The multi-layer barrier of claim 5, wherein the pesticide is lambda cyhalothrin.
9. The multi-layer barrier of claim 5, wherein the polymeric matrix is made from low density polyethylene.
- 10 10. The multi-layer barrier of claim 5, wherein the polyethylene is linear low density polyethylene.
11. The multi-layer barrier of claim 1 further comprising at least one fungicide-releasing layer inside the pesticide-retaining layers for preventing deterioration of the barrier by fungi.
- 15 12. The multi-layer barrier of claim 1 further comprising at least one strength and resistance layer inside the pesticide-retaining layers for providing strength and puncture resistance to the barrier.
- 20 13. The multi-layer barrier of claim 12, wherein the strength and resistance layer is made of a polymeric scrim.
14. The multi-layer barrier of claim 13, wherein the strength and resistance layer is made of polyethylene.
- 25 15. The multi-layer barrier of claim 1, wherein the pesticide is effective against termites, wood-boring ants, and wood-boring insects.
16. The multi-layer barrier of claim 1, wherein the barrier is shaped to surround an
- 30 area or a structure.
17. The multi-layer barrier of claim 1, wherein the release rate of the pesticide from the barrier is less than $0.4 \mu\text{g}/\text{cm}^2/\text{day}$.

18. The multi-layer barrier of claim 5, wherein the matrix comprises a polymer and further comprises a carrier to adjust the release rate of the pesticide from the matrix

5 19. A method of making a premix for an active layer of barrier film for use in preventing a wood-boring pest from accessing an area or a wood-containing structure, the method comprising the steps of:

- (a) mixing carbon black with particles of a polymer to form a mixture; and
- (b) adding one or more pesticides in a liquid form to the mixture to form a friable premix.

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20. A multi-layer barrier film for use in preventing a wood-boring pest from accessing an area or a wood-containing structure, the barrier film comprising:

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- a first layer comprising a protective resin;
- a second layer comprising a pesticide-retaining material which substantially prevents the pesticide from passing therethrough;
- a third layer comprising the protective resin;
- a fourth layer comprising a strength and puncture resistant film;
- a fifth layer comprising a bonding polymer;

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a sixth layer comprising a polymeric matrix containing carbon black and one or more pesticides;

a seventh layer comprising the pesticide-retaining material; and

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an eighth layer made of the protective resin wherein the rate of release of the pesticide from the sixth layer into the other layers is higher than the rate of release of the pesticide from the barrier film and wherein there is substantially no release of the pesticide from the barrier film itself.

21. The barrier film of claim 20, wherein the protective resin comprises a blend of polyolefin plastomer, color concentrate, and polyethylene.

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22. The barrier film of claim 20, wherein the protective resin provides ultraviolet protection to the barrier.

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23. The barrier film of claim 20, wherein the pesticide-retaining material substantially prevents the release of the pesticide from the barrier film.
- 5 24. The barrier film of claim 20, wherein the material of the second and seventh layers is a polymer having a melting point above approximately 143°C and is neither biodegradable nor photodegradable.
25. The barrier film of claim 20, wherein the pesticide-retaining material of the
10 second and seventh layers comprises Saranex® 14.
26. The barrier film of claim 25, wherein the Saranex® 14 consists of low density polyethylene, vinylidene chloride/vinyl chloride copolymer, ethylene/vinyl acetate copolymer, and silicon dioxide.
- 15 27. The barrier film of claim 20, wherein the resin of the third layer comprises a blend of polyolefin plastomer, color concentrate, and polyethylene.
28. The barrier film of claim 20, wherein the fourth layer is made of woven high
20 density polyethylene.
29. The barrier film of claim 20, wherein the fifth layer comprises a low density polyethylene having a melting point of approximately 165°C.
- 25 30. The barrier film of claim 20, wherein the carbon black of the sixth layer is lamp black.
31. The barrier film of claim 20, wherein the polymeric matrix of the sixth layer comprises low density polyethylene.
- 30 32. The barrier film of claim 20, wherein the polymeric matrix of the sixth layer comprises metallocene-catalyzed low density polyethylene.

33. The barrier film of claim 31, wherein the low density polyethylene has a melting point of approximately 80°C.
34. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is present in an amount such that its supply is not exhausted before approximately 10 years.
35. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is present in an amount of at least 5% of the sixth layer by weight.
36. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is present in an amount of at least 10% of the sixth layer by weight.
37. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is lambda cyhalothrin.
38. The barrier film of claim 37, wherein the lambda cyhalothrin in the sixth layer is present in an amount of at least approximately 2.75 grams per square meter of the barrier film.
39. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is a low volatility bioactive chemical.
40. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is selected from the group consisting of pyrethroid, isofenphos, fenvalerate, cypermethrin, pyrethrin, fenoxycarb, chlorpyrifos, diazinon, dichlorophen, methyl isothiocyanate, pentachlorophenol, tralomethrin and combinations thereof.
41. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is selected from the group consisting of tefluthrin, permethrin, lambda cyhalothrin, resmethrin, deltamethrin, cypermethrin, cyphenothrin, cyfluthrin, deltamethrin, chlorpyrifos, fenoxycarb, diazinon, dichlorophen, methyl isothiocyanate,

pentachlorophenol, tralomethrin, chlorfenapyr, fipronil, neonicotinoid and combinations thereof.

42. The barrier film of claim 20, wherein at least one of the pesticides in the sixth layer is selected from the group consisting of thiamethoxam, nitenpyram, imidacloprid, clothianidin, acetamiprid, thiacloprid, and combinations thereof.

43. The barrier film of claim 20, wherein the sixth layer is prepared by combining the pesticide with the carbon black to form a bound friable mix and adding the bound friable mix to the polymeric matrix.

44. The barrier film of claim 20, wherein the sixth layer includes at least one pesticide mixed with at least one fungicide.

45. The barrier film of claim 44, wherein the fungicide is selected from trichloronitromethane, a mixture of methylisothiocyanate and 1,3-dichloropropane, sodium N-methyl dithiocarbonate, 2,3,5,6-tetrachloro-1,9-benzoquinone, calcium cyanamide, biphenyl, copper naphthenate, dichlorophen, fentin hydroxide and combinations thereof.

46. The barrier film of claim 20, wherein the polymeric matrix is present in an amount of about 77% by weight of the sixth layer and wherein the sixth layer is present in an amount of about 23% by weight of the barrier film.

47. The barrier film of claim 20, wherein the carbon black is present in an amount of about 11% by weight of the sixth layer.

48. The barrier film of claim 20, wherein the polymeric matrix is hydrophobic.

49. The barrier film of claim 20, wherein the barrier film has a thickness of from about 0.010 inch to about 0.030 inch.

50. A barrier film for use in preventing a wood-boring pest from accessing an area or a wood-containing structure, the barrier film comprising:
- a first layer comprising a protective resin, the protective resin comprising a blend of polyolefin plastomer, color concentrate, and polyethylene;
 - 5 a second layer comprising a pesticide-retaining material which substantially prevents the pesticide from passing therethrough;
 - a third layer comprising the protective resin, the protective resin comprising a blend of polyolefin plastomer, color concentrate, and polyethylene;
 - a fourth layer comprising a strength and puncture resistant film comprising high
 - 10 density polyethylene;
 - a fifth layer comprising a low density polyethylene;
 - a sixth layer comprising a polymeric matrix containing carbon black and one or more pesticides;
 - a seventh layer comprising the pesticide-retaining material; and
 - 15 an eighth layer made of the protective resin, the protective resin comprising a blend of polyolefin plastomer, color concentrate, and polyethylene, wherein the rate of release of the pesticide from the sixth layer into the other layers is higher than the rate of release of the pesticide from the barrier film and wherein there is substantially no release of the pesticide from the barrier film itself.
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51. The barrier film of claim 50, wherein the pesticide-retaining material comprises Saranex® 14.
52. The barrier film of claim 50, wherein the carbon black is lamp black.
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53. A method for making a barrier film comprising the following steps:
- mixing carbon black with particles of a polymer to form a mixture;
 - adding one or more pesticides in a liquid form to the mixture while maintaining the mixture at a temperature below the temperature at which the pesticide decomposes
 - 30 but above the melting temperature of the pesticide to form a friable premix;
 - melt extruding the premix to form a thin active layer; and
 - extruding the premix along with first and second protective resins, a multilayer film, low density polyethylene, and scrim to form an eight-layer barrier film wherein:

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- a first layer comprising a first protective resin;
- a second layer comprising a pesticide-retaining film which substantially prevents the pesticide from passing therethrough;
- a third layer comprising a second protective resin;
- 5 a fourth layer comprising a scrim;
- a fifth layer comprising low density polyethylene;
- a sixth layer comprising an active layer comprising a mixture of a sixth layer polymeric matrix, carbon black, and one or more pesticides;
- a seventh layer comprising the pesticide-retaining film; and
- 10 an eighth layer comprising the first protective resin, wherein the rate of release of the pesticide from the sixth layer into the other layers is higher than the rate of release of the pesticide from the barrier film and wherein there is substantially no release of the pesticide from the barrier film itself.

15 54. The barrier film of claim 53, wherein the pesticide-retaining film comprises Saranex® 14.

55. The barrier film of claim 53, wherein the carbon black is lamp black.

20 56. The barrier film of claim 53, wherein the carbon black is a gas black.

57. A multi-layer barrier against pests comprising:
at least one pesticide-releasing layer comprising a polymeric matrix, the matrix comprising a pesticide and a carrier, the matrix and the carrier controlling the
25 release of the pesticide from the matrix; and

two pesticide-retaining layers positioned on opposite sides of the pesticide-releasing layer, the pesticide-releasing layer containing at least one pesticide, the pesticide-retaining layers releasing only minute amounts of the pesticide therethrough.

30 58. The multi-layer barrier of claim 57, wherein the pesticide-retaining layers comprise Saranex®.

59. The multi-layer barrier of claim 57, wherein the pesticide-retaining layers are made from a polymeric material, the polymeric material allowing substantially no release of the pesticide from the barrier.
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60. The multi-layer barrier of claim 57, wherein the thickness of the pesticide-retaining layers is from about 0.001 to about 0.005 inches.
61. The multi-layer barrier of claim 57, wherein the pesticide is selected from
- 10 pyrethroids, neonicotinoids, isofenphos, fenvalerate, pyrethrin, and combinations thereof.
62. The multi-layer barrier of claim 57, wherein the pesticide is selected from
- 15 tefluthrin, permethrin, lambda cyhalothrin, resmethrin, deltamethrin, cypermethrin, cyphenothrin, cyfluthrin, deltamethrin, chlorpyrifos, fenoxycarb, diazinon, dichlorophen, methyl isothiocyanate, pentachlorophenol, tralomethrin, chlorfenapyr, fipronil, neonicotinoids, and combinations thereof.
63. The barrier film of claim 57, wherein the pesticide is selected from the group
- 20 consisting of thiamethoxam, nitenpyram, imidacloprid, clothianidin, acetamiprid, thiacloprid, and combinations thereof.
64. The multi-layer barrier of claim 57, wherein the pesticide is lambda cyhalothrin.
- 25 65. The multi-layer barrier of claim 57, wherein the polymeric matrix is made from low density polyethylene.
66. The multi-layer barrier of claim 65, wherein the polyethylene is linear low density polyethylene.
- 30 67. The multi-layer barrier of claim 57, wherein the carrier is lamp black.

68. The multi-layer barrier of claim 57, wherein the thickness of the pesticide-releasing layer is from about 0.001 to about 0.005 inches.

69. The multi-layer barrier of claim 57, wherein the pesticide-releasing layer further comprises at least one fungicide selected from trichloronitromethane, a mixture of methylisothiocyanate and 1,3-dichloropropane, sodium N-methyl dithiocarbonate, 2,3,5,6-tetrachloro-1,9-benzoquinone, calcium cyanamide, biphenyl, copper naphthenate, dichlorophen, fentin hydroxide, and combinations thereof.

70. The multi-layer barrier of claim 57, further comprising at least one fungicide-releasing layer inside the pesticide-retaining layers for preventing deterioration of the barrier by fungi.

71. The multi-layer barrier of claim 57, further comprising at least one strength and resistance layer inside the pesticide-retaining layers for providing strength and puncture resistance to the barrier.

72. The multi-layer barrier of claim 71, wherein the strength and resistance layer is made of a polymeric scrim.

73. The multi-layer barrier of claim 71, wherein the strength and resistance layer is made of woven high density polyethylene.

74. The multi-layer barrier of claim 57, wherein the thickness of the barrier is in the range from about 0.010 to about 0.030 inches.

75. The multi-layer barrier of claim 57, further comprising at least one protective layer to protect the barrier from ultraviolet light and to provide sealability of the barrier.

76. The multi-layer barrier of claim 75, wherein the protective layer is made from a heat sealable polymer.